



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
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Mail and Fax
August 26, 2002

Mr. C. Scott Goulart
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SUBJECT: Evaluation of Possible Sources of Perchlorate in Arden Cordova Wells AC-3 and AC-4

Dear Mr. Goulart:

The Environmental Protection Agency (EPA), Regional Water Quality Control Board and Department of Toxic Substances Control (collectively "Agencies") have reviewed the report titled *Evaluation of Possible Sources of Perchlorate in Arden Cordova Wells AC-3 and AC-4*, prepared by Levine-Fricke and dated August 5, 2002. From the information provided, the Agencies cannot conclude that Aerojet has not contributed to the contamination as outlined in the following comments:

General Comments

1. Aerojet concludes that wells AC-3, AC-4, and Malaga are impacted by perchlorate from past nearby agricultural sources rather than perchlorate from the Aerojet site. The evidence provided in the report does not meet the threshold required by the Agencies to support the hypothesis. The Agencies believe that the same data can also be explained using Aerojet entirely as a source of perchlorate. The arguments provided lack the definite supporting data that would exclude Aerojet as a contributor to the perchlorate found at AC-3, AC-4, and the Malaga well. For example, sampling at thousands of agricultural sites across the United States of America (USA) has not found detectable concentrations of perchlorate in groundwater. Only fertilizer with Chilean nitrate salts have been found to contain perchlorate. Fertilizers containing Chilean saltpeter have had limited application in the USA per Urbansky (2001). Aerojet needs to present documentation of agricultural Chilean fertilizer use in the area to support the supposition that the perchlorate contamination was from agricultural fertilizer use. Even if Chilean fertilizer use in the area could be documented, Aerojet would need to show their perchlorate groundwater contamination did not contribute to the perchlorate contamination in the vicinity of the three water supply wells. Additional studies that would be required to prove Aerojet's argument may include chemical fingerprinting (e.g.,

chlorine isotopes), soil sampling in hypothesized former agricultural source areas, and installation/sampling of shallow and deep monitoring wells to verify the distribution of perchlorate and other chemicals in the vicinity of wells AC-3, AC-4, and Malaga. The Agencies are open to working with Aerojet to develop a work plan to perform these studies.

2. Given the nature of the hydrostratigraphy presented in cross-sections at Aerojet where a high-density of subsurface data are available, hydraulic communication between the (Aerojet-defined) aquifer layers in Operable Unit 3 (OU3) is very likely to occur. The Agencies do not believe Aerojet has demonstrated that the layers of the aquifer in the area of AC-3 and AC-4 are not connected. The Agencies believe that flow of perchlorate contaminated groundwater from Aerojet between layers and along preferential flow pathways under the influence of pumping is the most likely explanation of the presence of the perchlorate in wells AC-3, AC-4, and Malaga.
3. There is inadequate data to support the conclusion that historic groundwater capture zones for wells AC-3 and AC-4 do not intercept perchlorate contaminated groundwater downgradient of the Aerojet site. The groundwater flow model used to predict groundwater capture at wells AC-3 and AC-4 was developed for comparison of remedial alternatives in the OU3 Remedial Investigation/Feasibility Study (RI/FS). The model is a crude approximation of the groundwater flow conditions in the vicinity of wells AC-3 and AC-4. Computer simulations of groundwater flow in OU3 with the existing model are of very limited value in predicting capture zones for individual wells because of extreme uncertainties in the specific hydrostratigraphy, aquifer hydraulic properties, and contaminant concentrations in the vicinity of the affected wells. These uncertainties result from the limited monitoring wells and aquifer testing completed in the vicinity of wells AC-3, AC-4, and Malaga. For example, minor changes in model hydraulic conductivities will have a big impact on predicated particle travel times. Use of other reasonable hydraulic conductivities in the model could easily allow contaminants from Aerojet to be captured by the wells. The Agencies believe that modeling is an important tool in evaluating groundwater conditions at Aerojet. However, the existing model needs to be refined to incorporate site-specific data and re-calibrated before relying on it to reasonably and adequately predict groundwater capture for any wells in the OU3.
4. Aerojet concludes that agricultural fertilizers are the “likely” sources of perchlorate detected in wells AC-3 and AC-4. This argument appears to stem from a published paper by Susarla et al. (1999), which reported the presence of perchlorate in various fertilizer materials. Subsequent reports by Urbansky et al (2000), Susarla et al (2000) and Urbansky (2001) indicate that perchlorate only has been positively identified in materials derived from naturally occurring Chilean saltpeter (sodium nitrate), the documented quantities of Chilean saltpeter actually used in the USA have been very low. The perchlorate detected in fertilizers was from specialty products mainly used for landscaping and residential use. The main source of agricultural fertilizers in use in the USA are either synthesized from raw materials or derived from natural materials, which do not contain perchlorate.

Urbansky (2001) concludes there “is a consensus among researchers that there is insufficient evidence for fertilizers to be viewed as contributors to environmental perchlorate contamination, except for imported Chilean saltpeter or products derived from it...” and “...evidence obtained to date largely argues against fertilizers as sources of environmental perchlorate.” Furthermore, a recent survey of perchlorate in drinking water sources (Gullick et al. 2001) concluded that perchlorate is a localized problem associated with rocket fuel and military-related sites. The study found no documented association of perchlorate groundwater contamination and agricultural fertilizers.

Specific Comments

5. Page 2, Section 2.0, Background - More information is needed on wells AC-3, AC-4, Malaga, and other water supply wells in the area. At a minimum, the required information includes well logs, pumping histories, pumping rates, and aquifer testing results.
6. Page 6, Section 4.2, Perchlorate Occurrence in Aquifer Zones - Additional cross-sections are required to evaluate the hydrostratigraphy in the vicinity of wells AC-3, AC-4, and Malaga. A cross section along the flow path should be included so that stratigraphic relationships along the flow path could be evaluated. Such a cross-section would run from the vicinity around AC-20 southwest past the Malaga Well. At least one, and preferably two, cross- sections perpendicular to the flow path should be provided to evaluate lateral variations in hydrostratigraphy upgradient of the impacted wells. All boring logs used to create the cross-sections need to be provided with the document. In addition, groundwater potentiometric surface maps for each of the aquifers should be provided. The potentiometric surface maps should include the periods of time when AC-3, AC-4, and the Malaga Well are pumping, and when they are not pumping.
7. Page 7, Section 5.0, Inorganic Chemical Data - The land use analysis was limited to a small area around AC-3 and AC-4. The land use analysis should be extended to the entire area of the OU3 and legible copies of the air photos used in the analysis should be provided.
8. Page 7, Section 5.0, and Figure 4 - Aerojet argues that there is an association with nitrate and perchlorate in the vicinity of AC-3 and AC-4 that supports the fertilizer origin of the perchlorate in these wells. Only selected nitrate data are provided to support the argument. All available nitrate for the wells in the vicinity of wells AC-3, AC-4 and Malaga must be provided for the Agencies to evaluate this argument. Aerojet also argues that little vertical migration of perchlorate from Aerojet sources has or can occur. It is unclear why no vertical migration of perchlorate from the Aerojet sources to the affected wells is possible yet vertical migration of nitrate and perchlorate from agricultural sources can occur.
9. Figure 5 - This figure shows the distribution of agricultural land use in the vicinity of AC-3 and AC-4 in 1951. What the figure does not show is a ditch running from Buffalo Creek parallel to Coloma Road and terminating in the vicinity of Paseo Drive in Rancho Cordova

near AC-3 and AC-4. This ditch is clearly defined in the 1954 U.S.G.S. Fair Oaks 15 Minute Quadrangle. It is also shown on figures found in Department of Water Resources Bulletin No. 133, Folsom-East Sacramento Water Quality Investigation (March 1964). Depending on the duration and use of the water in the ditch, runoff from Aerojet containing perchlorate may have been utilized for irrigation of crop land depicted on Figure 5. Aerojet should investigate the duration of farming in the area depicted on Figure 5 and the use of water from Buffalo Creek to irrigate the crops.

References Cited

Gullick, R.W., M. W. LeChevallier and T. S. Barhorst. 2001. Occurrence of perchlorate in drinking water sources. *Journal American Water Works Association*. 93(1):66-77.

Susarla, S. T.W. Collette, A.W. Garrison, N.L. Wolfe, and S.C. McCutcheon. 2000. Correction to perchlorate identification in fertilizers. *Environmental Science & Technology*. 34: 224.

Urbansky, E. T., M. L. Magnuson and C. A. Kelty 2000. Comment on "Perchlorate Identification in Fertilizers" and the subsequent addition/correction. *Environmental Science & Technology* 34(20): 4452-4453.

Urbansky, E.T., T. Collete, W. Robarge, W.L. Hill, J. M. Silken and P. Kane. 2001 Survey of Fertilizers and Related Material for Perchlorate (ClO₄⁻): Final Report. EPA.

Should you have any questions on this correspondence please contact me at (415) 972-3146, Alex MacDonald at 255-3025 or Ed Cargile at 255-3703.

Sincerely,

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N. CA Cleanup Section (SFD-7-2)

cc: Ed Cargile, CALEPA/DTSC
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